the glandular cells, which in *Acanthodrilus* form a continuous covering to the lining epithelium, are segregated into groups; and this is accompanied by a branching of the cavity; it is important to notice that the vas deferens opens into the conjoined ducts of the glands before the latter becomes continuous with the muscular atrium.

These facts lead to the conclusion that the so called »prostate« of *Perichaeta* is the homologue of the atrium in other earthworms and in the Limicolae. In earthworms therefore there are two organs which have been termed »prostates«. (1) The atrium of *Acanthodrilus*, *Perichaeta* etc. (2) The atrium + prostate of *Moniligaster*[6].

3. Note on the Reproductive organs of Moniligaster.

By F. E. Beddard, London.

eingeg. 2. November 1887.

The reproductive organs of this remarkable Lumbricid have been described in three apparently different species by Perrier[1], Horst[2], and myself[3]. My description agrees in the main with that of Horst; while we both differ in many important particulars from Perrier.

According to Perrier *M. Deshayesi* is provided with two pairs of male sexual pores, each furnished with its own prostate, vas deferens and testis; the structure of these various organs is described in some detail. Horst and myself find only a single pair of male sexual orifices which correspond in position to the hindermost of the two pairs which Perrier believes to exist in this genus; in the species described by myself these orifices are between segments 9—10, in that of Horst between 11—12.

The anterior pair of orifices, that which opens between segments 7 and 8, is connected in *M. Barwelli* with a spermatheca and not with an anterior pair of vasa deferentia and testes; moreover in that species the aperture is on the boundary line between segments 6 and 7; in *M. Houteni* the structure of the reproductive organs is in this respect more like that of *M. Barwelli* than *M. Deshayesi*. Horst describes a single »kidney shaped pouch« on each side of the intestine in segment 9, which is connected »with a long, slender, coiled tube, communicating with the exterior by ... the pores between the 8th and 9th ring«. There is, it appears to me, an unlikelihood, from what we know of the structure of

[6] For the present I do not consider the »atrium« of *Criodrilus*.

[1] Nouv. Arch. d. Mus. t. VIII. (1872.) p. 133.

[2] Notes fr. Leyden Mus. Vol. IX. p. 98.

[3] Ann. and Mag. Nat. Hist. Feb. 1886. p. 95.

the *Oligochaeta*, that Perrier's observations on the male reproductive system should be correct; and this improbability is very greatly increased by the observations of Horst and myself. Furthermore it seems to me that Perrier's description can be construed in a different sense, and one which brings his observations more into accord with those of Horst and myself.

The »testes« of the 8th segment are described by Perrier as forming each »une petite masse ovoide d'un blanc crayeux«; the ovoid shape and the white colour distinguish also the spermathecae of *M. Barwelli*. The »vas deferens« (entortillée comme serait un *Gordius*) I have already identified[4] with the much convoluted stalk of the spermatheca in my species. I have since investigated this region of the body by transverse and longitudinal sections. I found that the spermatheca is lined by tall columnar cells as in other earthworms, outside which are muscular layers abundantly supplied with bloodvessels; the stalk is lined by a cubical epithelium but has the same muscular coat; I could discover no trace of cilia. It would be impossible, I think, from the minute structure of this organ to regard it as anything but a spermatheca. Perrier however describes the termination of the »vas deferens« in a funnel; the only structure with which I can identify this is the mesenterial fold which supports the spermatheca.

The supposed anterior pair of prostate glands of *Moniligaster Deshayesi* are identified by Horst[5] with the spermatheca of our species; I would myself suggest that they correspond to acessory spermathecal pouches which are so commonly present in Lumbricidae; the fact that they lie in a segment anterior to that which contains the spermatheca is quite reconcileable with such an hypothesis as to their nature; while their peculiar structure as depicted in Perrier's figures[6] is paralleled in the case of *Acanthodrilus Novae-Zelandiae*[7].

With regard to the apertures lying between segments 9—10) in *M. Barwelli*) — the posterior pair of orifices — there is practically no difference between the statements of Perrier, Horst and myself. We all agree that the vas deferens opens on the one hand into a »prostate« gland and is connected on the other with seminal reservoirs. The form of the so called »prostate« however differs somewhat in the three species; in *M. Deshayesi*, *M. Houteni* the »prostate« is a long tubular body similar in general appearance to a corresponding structure in *Acanthodrilus*. In *M. Barwelli* the »prostate« is a small oval body into

[4] l. c. p. 97.
[5] l. c. p. 100.
[6] l. c. Vol. IV. fig. 79.
[7] Proc. Zool. Soc. 1885. Vol. LIII. figs. 3 *cp*, 8.

one end of which the vas deferens opens; this body is lined throughout with a single layer of glandular looking cells, outside which are several layers of muscular fibres and outside these again peculiarly modified peritoneal cells. The structure of this body is in fact identical with that of the atrium in *Stylaria lacustris*[8]. There is thus an additional ressemblance to the vasa deferentia of the lower *Oligochaeta*.

The receptacula seminis (seminal vesicles) appear on dissection to lie partly in segment 8 and partly in segment 9. Longitudinal sections appeared to show that this was produced by the bulging of the thin septum lying between segments 8 and 9; the funnel of the vas deferens which I have not hitherto been able to describe[9] is situated in the interior of the receptaculum seminis[10] as in many other Lumbricidae; it is a simple disc-shaped expansion as in many of the lower *Oligochaeta*; among earthworms the vas deferens funnel is usually much plicated.

I have already called attention to the fact that the vasa deferentia of *Moniligaster* ressemble those of the *Naidomorpha* in being single and in being contained in two segments, the external aperture in one and the internal funnel in the other. I am not however quite certain that this is really the case; the appearances presented by longitudinal sections would seem to indicate that the vas deferens as well as the receptaculum seminis are contained in a single segment. If this is really the case the condition is paralleled in *Stylaria* where the funnels open into the same segment as that which bears the external aperture, close to its anterior mesentery. Finally the position of the male pores on the boundary line between two segments though not found in any other earthworm is common among the Limicolae.

Dr. Horst describes a receptaculum ovorum attached to the posterior side of segment 13 which evidently corresponds to the ovary of *M. Deshayesi*[11] I would point out that the justice of Horst's surmise that this structure is really a receptaculum ovorum is borne out by Perrier's figure of the minute structure of the corresponding organ in *M. Deshayesi*[12]; in this figure the organ is seen to be divided up into

[8] Vejdovský, System u. Morphol. d. Oligochaeten. Vol. IV. fig. 10.

[9] Ann. and Mag. Nat. Hist. l. c.

[10] This term is used to correspond with receptaculum ovorum. The term vesicula seminalis, which has been used in the same sense, is better restricted to the glandular portion of the atrium.

[11] l. c. Vol. IV. figs. 77, 81 *o*.

[12] l. c. Vol. IV. fig. 82.

numerous compartments by trabeculae; in these compartments lie mature ova. This is exactly the structure of the receptaculum, and not of the ovary, in other Lumbricidae. The apertures of the oviduct are situated according to Horst upon the 11th segment i. e. behind the male apertures. This again is a character unknown in any other earthworm, but very usual among the »Limicolae«. (e. g. *Rhynchelmis*, *Phreabothrix*.)

Even supposing that the external pores only exist, and that the oviducts have disappeared as Horst thinks may possibly be the case in his species, the ressemblances of this part of the reproductive system will still be with the »Limicolae«; for in the Enchytraeidae etc. there are simply pores which function as oviducts and these pores are situated behind the male orifices.

In fact the genus *Moniligaster* in respect of its reproductive organs is widely different from any other earthworm[13], but presents numerous points of ressemblance to certain Limicolous forms. These facts therefore militate against any such division of the *Oligochaeta* as that suggested by Claparède, and which has found its way into many textbooks of Zoology.

London, Oct. 28, 1887.

4. Das larvale und definitive Excretionssystem.

Von Franz Vejdovský in Prag.

eingeg. 3. November 1887.

Nachdem ich meine Untersuchungen über die Embryologie der Oligochaeten zu einem gewissen Abschlusse gebracht habe, erlaube ich mir an dieser Stelle vorläufig einige Angaben über die Entwicklung des Excretionssystems mitzutheilen, wobei ich mich vornehmlich auf die Bildung der besprochenen Organe der Lumbriciden und der von *Rhynchelmis* berufe.

Sämmtliche untersuchten Lumbriciden (7 einheimische Arten) durchlaufen ein Larvenstadium, welches durch nachfolgende Merkmale characterisirt ist:

Von der Bauch- oder Rückenseite betrachtet, sind die Larven mehr oder weniger ovoid, bei anderen Arten ellipsoidisch, bei *Dendrobaena* kugelig. Das einschichtige Epiblast ist auf der Bauchseite bewimpert, wodurch die Larven nach der Beschaffenheit der Eiweißflüssigkeit mehr oder weniger lebhaft rotirende Bewegungen ausüben

[13] In other features of its organization *Moniligaster* agrees with many other earthworms.